NEW UTILITY PATENT APPLICATION TRANSMITTAL

☐ DUPLICATE

Address to:
Assistant Commissioner for Patents
Box PATENT APPLICATION
Washington, DC 20231

Attorney Docket No.	EM/SU/4973
First Named Inventor (or identifier)	SU et al.
Total Pages	16

This submits a new application under 37 CFR 1.53(b).

Entitled: SUBSTRATE SAWING PROCESS FOR A STRIP

☒ 1. Submitted herewith are the following:

_6_ pages of specification, including an Abstract,
_2_ sheet(s) of drawings, and
_6 claim(s).

☒ 2. Submitted herewith is an Oath/Declaration signed by each inventor.

☐ 3. Submitted herewith are the following:
- ☐ __ signed Independent Inventor Small Entity Statement(s),
- ☐ __ signed Small Business Small Entity Statement(s),
- ☐ __ signed Non-Profit Small Entity Statement(s).
- ☐ __ signed Non-Inventor Small Entity Statement(s),

☐ 4. A preliminary amendment is enclosed.

☐ 5. Submitted herewith is an Information Disclosure Statement, ___ pages of Form PTO-1449, and one copy of each document listed thereon.

☒ 6. An assignment of the invention to Advanced Semiconductor Engineering, Inc.

☐ 7. A certified copy of application no. _____ in _____.

☒ 8. The Commissioner is authorized to credit any over payment and charge any deficiency in any fees required under 37 CFR 1.16, 1.17 and/or 1.18, to Deposit Account No. 02-0200.

☒ 9. A check in the amount of $ 800.00 is submitted herewith.

☐ 10. Other:_____

THE FILING FEE IS CALCULATED AS FOLLOWS:					
				Basic Fee:	$760.00
Total Claims:	6	- 20 =	0	X $18 =	$0.00
Independent Claims:	1	- 3 =	0	X $78 =	$0.00
				Multiple Dependent Claim (add $260.00):	
				Subtotal:	$760.00
				50% Reduction if Small Entity Status:	
				Total:	$760.00

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Substrate sawing Process for a Strip

Background of the Invention

1. Field of the Invention

The present invention relates generally to a substrate sawing process for a strip and more particularly to a substrate sawing process by the multi-alignment on a strip.

2. Description of the Related Art

A conventional substrate sawing process comprises an alignment for positioning a strip so as to adjust the position of a saw machine and to arrange the position of the cutting tracks for substrate sawing. As shown in FIG. 1, a strip 100 comprises a plurality of areas 110 which are aligned along the longitudinal direction. The substrate areas 110 have a plurality of alignment marks 111 for positioning a saw machine and cutting marks 112 which are provided for measuring or predetermining arrangement of the cutting tracks 101 of the substrate sawing process. After the saw machine is positioned and the cutting tracks 101 are arranged, the saw machine saws the strip 100 along the cutting track 101 which is defined by the cutting marks 112. However, the saw machine can choose only a set of the outermost alignment marks 111 of the substrate 100 to define a reference point and utilizes the cutting marks 112, located around the substrate areas 110, to predetermine the cutting tracks 101 in the first phase and the cutting tracks (not shown) in the second phase.

The strip 100 is packaged in high temperature circumstances and results in an expansion. When the strip 100 returns to normal temperature, shrinkage in all dimensions occurs. However, each strip has variability which results in different amounts of shrinkage of the strips 100 when returning from high temperature to normal temperature. Even if the strips 100 are controlled in the same process and made of the same material, the shrinkage of the strip 100 is still different. Therefore, each strip 100 needs to be measured to define the cutting tracks in the first phase and the second phase. Then the saw machine detects the reference point of the alignment of the substrate areas 110 and moves to the predetermined position to cut the strip 100 along the cutting tracks. Because the saw machine cuts the strips 100 (which have

different shrinkage) by the predetermined cutting tracks 101, the cutting error A of each substrate area 110 adds to the peripheral substrate areas 110 in all dimensions on the strips 100, even though the cutting tracks are predetermined.

The present invention intends to provide a substrate sawing process that saws the strips in alignment with each of the substrate areas. The saw machine is mechanically moved to the substrate areas and is positioned by the alignment of each of the substrate areas for the substrate sawing process. This reduces the cutting error in such a way as to mitigate and overcome the above problem. Because the saw machine is positioned on each of the substrate areas by corresponding alignment, a cutting error resulting from cutting of each substrate area cannot add to the peripheral substrate areas.

Summary of the Invention

The primary objective of this invention is to provide a substrate sawing process for a strip of substrate that includes multi-alignment so a machine can be mechanically moved to the substrate areas and can be positioned by the corresponding alignments of each of the substrate areas to reduce the cutting error. Because saw machine is positioned on each substrate areas by corresponding alignment, a cutting error in any of the substrate areas cannot add to the peripheral substrate areas.

The present invention is a substrate sawing process in accordance with an embodiment; the substrate sawing process mainly includes multi-alignment corresponding to a plurality of substrate areas of strips which are arranged side-by-side on a plate. A saw machine is mechanically moved to the substrate areas and is positioned by the alignments of corresponding substrate areas for cutting the substrate areas of the strips in the first phase. And then the saw machine is further mechanically moved to the substrate areas again and is positioned by the alignments of corresponding substrate areas again for cutting the substrate areas of the strips in the second phase. Therefore, a cutting error in any of the substrate areas in the first phase and second phase cannot add to the peripheral substrate areas.

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description and the accompanying

drawings.

Brief Description of the Drawings

The present invention will now be described in detail with reference to the accompanying drawings herein;

FIG. 1 is a top view of a plurality of cutting tracks of a strip;

FIG. 2 is a top view of the cutting tracks of a strip in the first phase in accordance with the first embodiment of the present invention;

FIG. 3 is a top view of the cutting tracks of a strip in the second phase in accordance with the first embodiment of the present invention;

FIG. 4 is a top view of the cutting tracks of a strip in the first phase in accordance with the second embodiment of the present invention; and

FIG. 5 is a top view of the cutting tracks of a strip in the second phase in accordance with the second embodiment of the present invention.

Detailed Description of the Invention

The substrate sawing process of the present invention mainly includes multi-alignment corresponding to a plurality of substrate areas of strip or strips which are arranged side by side on a plate. A saw machine is mechanically moved to the substrate areas and is positioned by the alignments of corresponding substrate areas to cut the substrate areas of the strips in the first phase. Then the saw machine is further mechanically moved to the substrate areas again and is positioned by the alignments of corresponding substrate areas again to cut the substrate areas of the strips in the second phase. Substrate sawing process of the present invention is also mainly adapted to cut a strip or juxtaposed strips in the first phase and in the second phase.

Referring to FIG. 2, the sawing process of the present invention in accordance with the first embodiment, a strip 100 is placed on a plate (not shown) and is preferably suctioned to attach to the top surface of the plate through the air-holes arranged on the plate. The strip 100 comprises a plurality of substrate areas 110 which is aligned in the longitudinal direction and a plurality of alignment marks 111

which is arranged around the substrate areas 110. A saw machine (not shown) is mechanically moved to the substrate areas 110 and is positioned by the alignment marks 111 of corresponding substrate areas 110. Then the saw machine measures or predetermines the cutting tracks 101 by cutting marks 112 of each substrate areas 110, and then cuts the substrate areas 110 of the strip 100 in the first phase. The saw machine utilizes multi-alignment for positioning on the strip 100 and further utilizes a plurality of the cutting marks 112 to define the cutting tracks 101 in the first phase. Even though each of the strips 100 has unpredictable shrinkage caused by returning from high temperature to normal temperature, the saw machine is adjustably positioned in each of the substrate areas 110 by corresponding alignment marks 111 to avoid the error of each of the substrate areas 110 adding to the peripheral substrate areas 110 during the next substrate sawing process. Therefore, the cutting error A of the substrate areas 110 is smaller than a predetermined value to provide accurate and controlled dimensions of the substrate. The alignment substantially consists of at least three points which are arranged around the encapsulated area of the substrate, and the cutting track substantially consists of two cutting marks which are arranged in the area formed by the alignment. It follows that the saw machine finds the reference point of alignment of each of the strips 100 and cut each strip 100 along the predetermined cutting tracks in the first phase and the second phase to provide accurate and controlled dimensions of the singulated substrate.

Comparing FIG. 1 with FIG. 2, the conventional sawing process is comparable to the present invention in that the saw machine can choose only a set of the outermost alignment marks 111 of the substrate 100 to define a reference point and then utilizes the cutting marks 112, located around the substrate areas 110, to predetermine the cutting tracks 101 in the first phase. Because the strips 100, which have unpredictable shrinkage, fail to contact the predetermined cutting tracks 101, accurate and controlled dimensions of the singulated substrate cannot be provided, and it cannot be applied to cut the strip in a plurality of substrate areas. However, the saw machine of the present invention is mechanically moved to the substrate areas 110 and is positioned by the alignment marks 111 of corresponding substrate areas 110 on which are arrayed a plurality of substrates in equidistance. Therefore it is easy to measure

the cutting marks 112 to define the cutting tracks 101, and the saw machine cuts each strip 100 along the cutting tracks 101. The cutting error A of the substrate areas 110 is smaller than a predetermined value to provide accurate and controlled dimensions of the substrate.

Referring to FIG. 3, the saw machine measures or predetermines the cutting tracks 102 by cutting marks 112 of each of the substrate areas 110 in the second phase, and the cutting tracks 102 are restricted in each of the substrate areas 110. The strip 100 is cut along the cutting tracks 101 and the cutting tracks 102 to form the substrate of the semiconductor device.

Referring to FIG. 4, the sawing process of the present invention in accordance with the second embodiment, a strip 100 and a strip 200 juxtapose on a plate (not shown). The strips 100 and 200 have a plurality of substrate areas 110 and 210 which are adjacent to one another. The saw machine cuts the strips 100 and 200 along the cutting tracks 101 in the first phase.

Referring to FIG. 5, the saw machine cuts the strips 100 and 200 along the cutting tracks 102 in the second phase which is restricted in each of the substrate areas 110 and 210. The strips 100 and 200 are cut along the cutting tracks 101 and the cutting tracks 102 to form the substrate of the semiconductor device. It follows that the saw machine find the reference point of alignment of each of the strips 100 and 200 and cuts each strip 100 and 200 along the predetermined cutting tracks in the first phase and the second phase.

Although the invention has been described in detail with reference to its present preferred embodiment, it will be understood by one of ordinary skill in the art that various modifications can be made without departing from the spirit and the scope of the invention, as set forth in the appended claims.

What is claimed is:

1. A substrate sawing process for a strip comprising:

a strip having a plurality of substrate areas, being cut on each of the substrate areas in the first phase by multi-alignment; and

the strip being cut on each of the substrate areas in the second phase by multi-alignment;

wherein the multi-alignment substantially consists of a plurality of alignments which are arranged around each of the substrate areas.

2. The substrate sawing process, as defined in Claim 1, wherein the alignment is arranged around the encapsulated area of the substrate.

3. The substrate sawing process, as defined in Claim 1, wherein the alignment substantially consists of at least three points.

4. The substrate sawing process, as defined in Claim 1, wherein the strip further comprises a plurality of cutting marks around the substrate areas to define a plurality of cutting tracks in the first phase and the second phase.

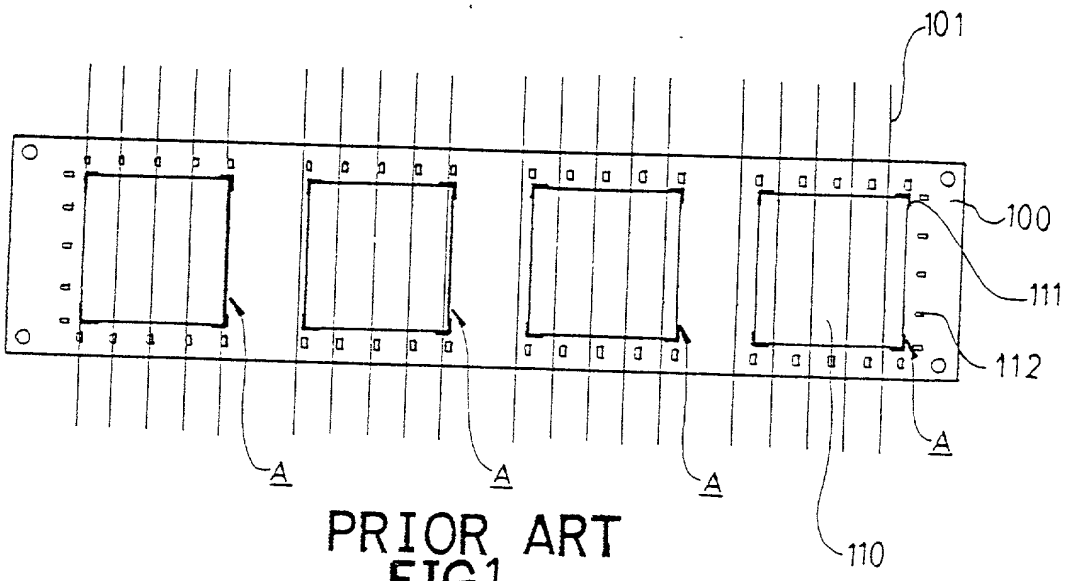
5. The substrate sawing process, as defined in Claim 1, wherein the first phase is at a right angle to the second phase in a parallel plane.

6. The substrate sawing process, as defined in Claim 1, wherein at least two strips juxtapose on a plane, the strips having a plurality of substrate areas and being cut on each of the substrate areas in the first phase and the second phase by multi-alignment.

Substrate Sawing Process for a Strip

Abstract of the Disclosure

The substrate sawing process for a strip mainly includes multi-alignment corresponding to a plurality of substrate areas of strips which are arranged side-by-side on a plate. A saw machine is mechanically moved to the substrate areas and is positioned by the alignments of corresponding substrate areas for cutting the substrate areas of the strips in the first phase. Then the saw machine is further mechanically moved to the substrate areas again and is positioned by the alignments of corresponding substrate areas again for cutting the substrate areas of the strips in the second phase. Therefore, an error in any of the substrate areas in the first phase and second phase cannot add to the peripheral substrate areas.



PRIOR ART
FIG.1

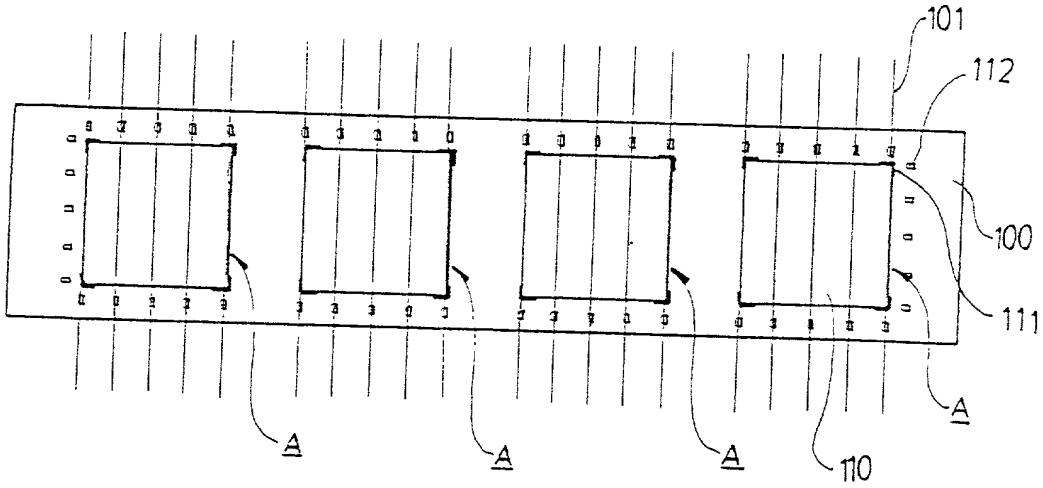


FIG.2

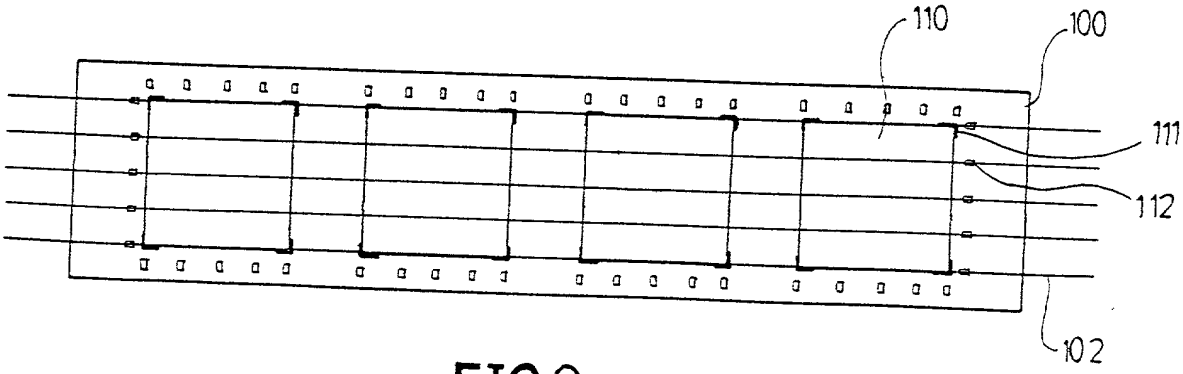


FIG.3

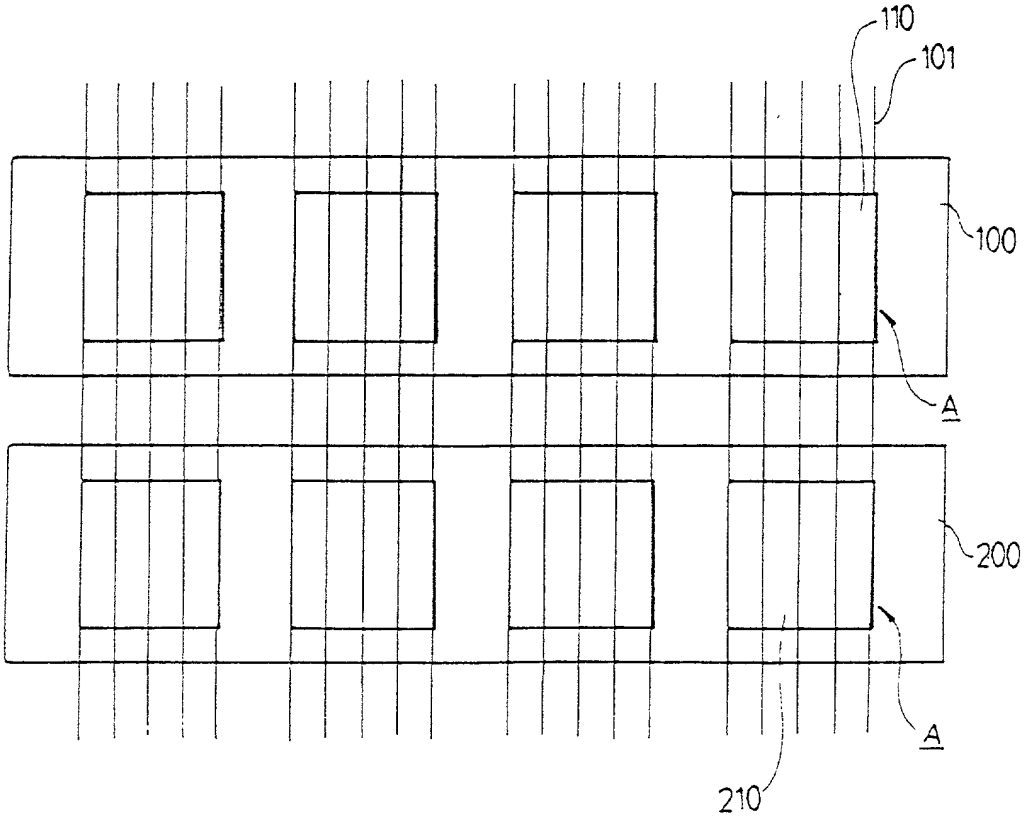


FIG.4

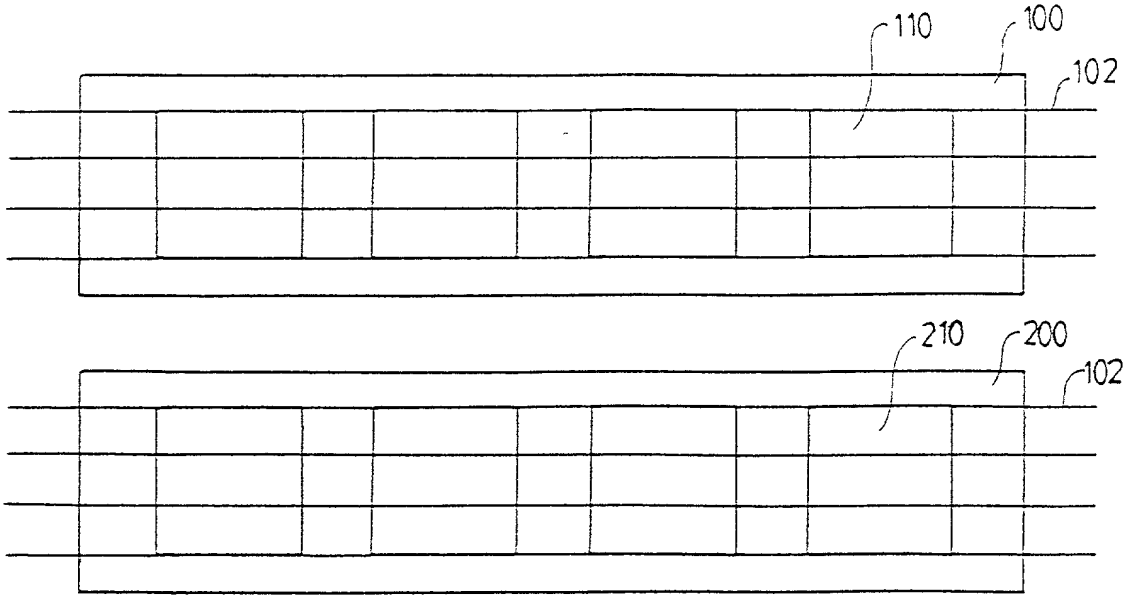


FIG.5

DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention (Design, if applicable) entitled:

Substrate Sawing Process For A Strip

the specification of which (check one):

☒ is attached hereto, or ☐ was filed on: as U.S. Application Number or PCT International Application Number:

and (if applicable) was amended on:

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56*. I hereby claim foreign priority benefits under *Title 35, United States Code §119* of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)			PRIORITY CLAIMED	
Number	Country	Day/Month/Year Filed	Yes	No

☐ Additional Priority Application(s) Listed on Following Page(s)

I HEREBY CLAIM THE BENEFIT UNDER TITLE 35 U.S. CODE §119(E) OF ANY U.S. PROVISIONAL APPLICATIONS LISTED BELOW.	
Application Number	Day/Month/Year Filed

☐ Additional Provisional Application(s) Listed on Following Page(s)

I hereby claim the benefit under *Title 35, United States Code, §120* of any United States application(s) or PCT international application(s) designating The United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of *Title 35, United States Code, §112*, I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56* which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

Application Number	Filing Date	Status - Patented, Pending or Abandoned

☐ Additional US/PCT Priority Application(s) listed on Following Page(s)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under *section 1001 of title 18 of the United States Code* and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: I (We) hereby appoint as my (our) attorneys, with full powers of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: J. Ernest Kenney, Reg. No. 19,179; Eugene Mar, Reg. No. 25,893; Richard E. Fichter, Reg. No. 26,382; Charles R. Wolfe, Jr., Reg. No. 28,680; Thomas J. Moore, Reg. No. 28,974; Bruce H. Troxell, Reg. No. 26,592; and

I(we) authorize my(our) attorneys to accept and follow instructions from Five Continents International PTO regarding any matter related to the preparation, examination, grant and maintenance of this application, any continuation, continuation-in-part or divisional based thereon, and any patent resulting therefrom, until I(we) or my(our) assigns withdraw this authorization in writing.

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DATE August 10, 1999	SIGNATURE Jau-Yuen Su

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Date	Signature

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Date	Signature

Full Name of Joint Inventor	Citizenship
Residence Address	Post Office Address ☐ Same as Residence
Date	Signature

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Date	Signature

☐ See following page(s) for additional joint inventors.